



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, DC 20503
www.uspto.gov

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
09/817,154	03/27/2001	Norihiko Kiritani	50195-257	7093

7590 10/24/2002
McDERMOTT, WILL & EMERY
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER

TOLEDO, FERNANDO L

ART UNIT	PAPER NUMBER
----------	--------------

2823

DATE MAILED: 10/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/817,154

Applicant(s)

KIRITANI, NORIHIKO

Examiner

Fernando Toledo

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 08 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 19 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-4, 6-8, 10 and 12-18 is/are rejected.
- 7) ☐ Claim(s) 5, 9 and 11 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 27 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 6) ☐ Other

DETAILED ACTION

Election/Restrictions

1. Claims 19 – 20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 5.
2. Applicant's election with traverse of claims 1 – 18 in Paper No. 5 is acknowledged. The traversal is on the ground(s) that Examiner did not provide sufficient support for the restriction requirement by stated that the process and apparatus are distinct because the process as claimed could be practice using a different apparatus or the apparatus could be used to practice another materially different process. This is not found persuasive because Examiner did provide a more substantial reason by stating that the device could be oxidized in a water rich environment in a submerged hotplate or a conventional furnace.

The requirement is still deemed proper and is therefore made FINAL.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 – 4 and 6 – 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tyagi et al. ("An Isoplanar Isolation Technology for SiC Devices Using Local Oxidation" pages 2188 – 2191) in view of Ueno et al. (U. S. patent 6,265,326 B1).

In re claim 1, Tyagi in the article "An Isoplanar Isolation Technology for SiC Devices Using Local Oxidation" teaches depositing a silicon film over a SiC substrate; delineating the silicon film into a required pattern; and annealing the SiC substrate to selectively grow a localized thermal film above the SiC substrate (pages 2188 – 2191).

Tyagi does not teach annealing the SiC substrate in a water rich ambient.

However, Ueno in the U. S. patent U. S. patent 6,265,326 B1; figures 1 – 4 and related text, discloses thermally growing an oxide layer in a water rich environment to increase the speed of formation of a thermal oxide (abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to anneal the SiC substrate of Tyagi in water rich vapor, as taught by Ueno, since it would increase the speed of formation of a thermal oxide.

In re claim 2, Tyagi in view of Ueno discloses wherein H₂O partial pressure in the water rich ambient is selected such that oxidation rate for the silicon film is larger than that for SiC substrate (abstract).

In re claim 3, Tyagi in view of Ueno discloses wherein the H₂O partial pressure in water rich ambient is kept more than 0.95 (figure 4).

In re claim 4, Tyagi discloses wherein the silicon film is delineated into a pattern for an element isolation region (figure 4).

In re claim 6, Tyagi discloses forming a blanket silicon oxide film at a surface of the SiC substrate in an oxygen added ambient, before depositing the silicon film so that the silicon film can deposit on the blanket silicon oxide film (figure 4).

In re claim 7, Tyagi in view of Ueno discloses wherein the H₂O partial pressure in the oxygen added ambient is kept less than 0.95 (figure 4).

In re claim 8, Tyagi discloses selectively removing the blanket silicon oxide film using the silicon film as an etching mask so as to expose a part of the surface of the SiC substrate, before the silicon film is selectively oxidized in the water rich ambient (figure 4).

In re claim 10, Tyagi in view of Ueno does not disclose wherein the water is ultra pure water.

However, It would have been obvious to one having ordinary skill in the art at the time the invention was made to use ultra pure water in the invention of Tyagi Ueno since ultra pure water does not carry any type of impurities that could adversely affect the electrical and chemical properties of the device that could later diminish the effectiveness of the device.

5. Claims 13 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Palmour (U. S. patent 5,459,107) in view of Ueno.

In re claims 13 and 18, Palmour in the U. S. patent 5,459,107; figures 1A – 4C and related text discloses forming a gate oxide film on a surface of a SiC substrate; and annealing the gate oxide film.

Palmour does not show wherein the annealing takes place in a water rich environment at a temperature equal to or lower than the substrate temperature at which the gate oxide film is formed and that that temperature is of about 700°C – 1050°C.

Ueno discloses that to increase the rate of speed of formation of a thermal oxide film of a silicon carbide semiconductor device, the partial pressure of water is controlled within a range of 0.1 to 0.95 (abstract) at a temperature of about 1000°C (column 3).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to anneal in a water rich environment at a temperature equal to or lower than the substrate temperature at which the gate oxide film is formed and that that temperature is of about 700°C – 1050°C in the invention of Palmour, since as taught by Ueno to increase the rate of speed of formation of a thermal oxide film of a silicon carbide semiconductor device, the partial pressure of water is controlled within a range of 0.1 to 0.95 at a temperature of about 1000°C.

In re claim 14, Palmour in view of Ueno teaches wherein the partial pressure of H₂O in the water rich ambient is kept more than 0.95 (figure 4).

In re claim 15, Palmour discloses wherein forming the gate oxide film includes oxidizing the surface of the SiC substrate in an oxygen added ambient (column 2).

In re claim 16, Palmour and Ueno teaches wherein H₂O partial pressure in the oxygen added ambient is kept less than 0.95 (figure 4).

In re claim 17, Palmour discloses wherein forming the gate oxide film includes: depositing a silicon film 13 at the surface of the SiC substrate; annealing the SiC substrate to grow the gate oxide film at the surface of the SiC substrate (figure 3B).

Palmour does not disclose annealing in a water rich environment.

Ueno discloses that to increase the rate of speed of formation of a thermal oxide film of a silicon carbide semiconductor device, the partial pressure of water is controlled within a range of 0.1 to 0.95 (abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to anneal in a water rich environment in the invention of Palmour, since as taught by Ueno to increase the rate of speed of formation of a thermal oxide film of a silicon carbide semiconductor device, the partial pressure of water is controlled within a range of 0.1 to 0.95.

Claim Objections

6. Claims 5, 9 and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is 703-305-0567. The examiner can normally be reached on Mon-Fri 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for

Application/Control Number: 09/817,154

Page 7

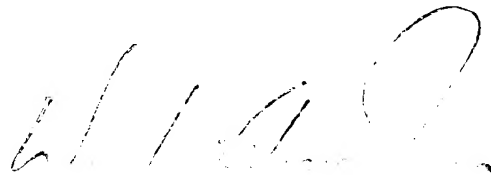
Art Unit: 2823

the organization where this application or proceeding is assigned are 703-308-7382 for regular communications and 703-308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Fernando Toledo
Examiner
Art Unit 2823

ft
October 18, 2002


S. 3